

SN 10/616,610

Docket No. S-100,580In Response to Office Action dated October 12, 2006

REMARKS

Claims 1-16 are pending in the present patent application. Claims 1-16 have been rejected.

Claims 3 and 4 are rejected under 35 U.S.C. 112, second paragraph. According to the present Office Action, in claim 3, the Markush group is not in the format as "selected from the group consisting of...", and in claim 4, the phrase "where said reactive support gas ... providing a layer..." is either incomplete or indefinite.

Please cancel claims 2-4.

Claims 1-3 and 12-15 are rejected under 35 U.S.C. 102(b) as anticipated by, or in the alternative, under 35 U.S.C. 103(a) as obvious over U.S. Patent 5,466,424 to Kusano et al. in light of U.S. Patent 5,041,304 to Kusano et al. According to the present Office Action, "...Kusano '424's invention is directed to a corona discharge surface treatment method and apparatus thereof. Kusano '424 discloses that the apparatus comprises the recited plasma generating region and first and second electrodes within the plasma-generating region where the electrodes are of parallel plate electrodes and the plasma generation is by a DC discharge (Fig. 1 and col. 5, lines 5-26 and col. 6, lines 21-31). Kusano '424 also discloses in col. 4, lines 53-57 that the treatment is carried [out] with a reactant gas diluted with other gases such as argon. Kusano '304 shows in a surface plasma treatment under atmospheric pressure a line for supplying a reactive gas, a line for supplying another gas, and a line for mixing the reactive gas with the other gas and for supplying the mixture to the plasma generating region (Fig. 1). As such the above claims are anticipated by the teachings of Kusano '424 in light of Kusano '304. If not, the provision of the mixed gas line from two separate gas lines would be within the level of ordinary skill in the art. As to the subject matter of claim 3, it is inherently in Fig. 1 of Kusano '304...".

Applicant has amended claim 1. Claim 1 now relates to a mini-plasma device that includes an active reaction gas tube in fluid communication with the discharge chamber for sending active reaction gas into the discharge chamber, and a plasma support gas tube in fluid communication with the discharge chamber for sending plasma support gas into the discharge chamber, and the plasma support gas tube, the active reaction gas tube, and the housing are configured such that active reaction gas that passes through

SN 10/616,610

Docket No. S-100,580In Response to Office Action dated October 12, 2006

the discharge chamber is surrounded by a layer of plasma support gas. Support for these changes can be found in the instant patent application in FIGURE 3, and in the parts of the specification that describe FIGURE 3, such as on page 9 line 2 through line 11. Applicant submits that neither Kusano '424 nor Kusano '304, alone or in combination, suggest a configuration resulting in a layer of plasma support gas surrounding an active reaction gas as the gases move through a discharge chamber. With these changes, Applicant submits that claim 1 is not anticipated by either Kusano '424 or Kusano '304, or obvious over Kusano '424 in view of Kusano '304, and Applicant respectfully requests that the rejections under 102(b) and 103(a) over the Kusano patents, alone or in combination, be withdrawn.

Claim 4 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Kusano '424 in light of Kusano '304 in view of U.S. Patent 5,830,540 to Bowers.

Applicant has cancelled claim 4.

Claim 5 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Kusano '424 in light of Kusano '304 in view of U.S. Patent 5,693,241 to Banks et al. According to the Office Action, "...the difference between the reference as applied above and the instant claim is the provision of flowmeter. Banks shows the limitation in a plasma surface treating apparatus (Fig. 2). The subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the reference's teaching as suggested by Banks because this would result in precise mixing and control of flow of the reactive gas and to the reactive gas and other gas..."

Applicant has amended claim 5 to positively recite the first flowmeter and the second flowmeter. Claim 5 is dependent from claim 1, which has been amended as described above. Neither of the Kusano patents, nor the Banks patent, teach or suggest a device with an active reaction gas tube in fluid communication with the discharge chamber for sending active reaction gas into the discharge chamber, and a plasma support gas tube in fluid communication with the discharge chamber for sending plasma support gas into the discharge chamber where the plasma support gas tube, the active reaction gas tube, and the housing are configured such that active reaction gas that passes through the discharge chamber is surrounded by a layer of plasma support gas.

SN 10/616,610

Docket No. S-100,580In Response to Office Action dated October 12, 2006

Applicant submits that with the amendment to claim 1, claim 5, which depends from claim 1, is not obvious under 35 U.S.C. 103(a) over Kusano '424 in light of Kusano '304 in view of U.S. Patent 5,693,241 to Banks et al.

Claims 4 and 6-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kusano '424 in light of Kusano '430 in view of U.S. Patent 6,224,837 to Okamoto et al. and/or U.S. Patent 7,079,370 to Dong et al. According to the Office Action, "...The differences between the reference as applied above and the instant claim are the provision of gas inlets' configuration and the power source. Okamoto shows the limitations in a corona discharge apparatus of the boosting of the DC power from the battery by a DC-DC converter prior to the corona discharge device (Fig. 4) and the use of a transformer in the case of using a voltage source with a frequency (Fig. 7). Dong shows in an apparatus for generating atmospheric pressure plasma that the provision of the configuration of separate gas inlets in addition to an inlet with the mixed gases (Figs. 7 and 5). Dong also shows that DC or AC voltage source can be used (col. 7, lines 50-65) and the voltage may be constant or pulsed (col. 9, lines 33-35). The subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the reference's teaching as suggested by Okamoto or Dong because this would result in providing proper voltage to be applied to electrodes or the selection of any of known equivalent configurations of gas inlets would be within the level of ordinary skill in the art. As to the subject matter of each of claims 9-11, the selection of any of known equivalent batteries for the power source would be within the level of ordinary skill in the art..."

Claims 4, 10, and 11 have been cancelled. Claims 6-9 depend from claim 1, which has been amended and now is concerned with a device that includes an active reaction gas tube in fluid communication with the discharge chamber for sending active reaction gas into the discharge chamber, and a plasma support gas tube in fluid communication with the discharge chamber for sending plasma support gas into the discharge chamber where the plasma support gas tube, the active reaction gas tube, and the housing are configured such that active reaction gas that passes through the discharge chamber is surrounded by a layer of plasma support gas. Claims 6-9 by virtue of their dependency on claim 1, also include these features. Neither of the Kusano

SN 10/616,610

Docket No. S-100,580In Response to Office Action dated October 12, 2006

patents, nor the Dong patent, nor the Okamoto patent teach or suggest a device with these features. For these reasons, Applicant submits that claims 6-9 are not obvious under 35 U.S.C. 103(a) over Kusano '424 in light of Kusano '430 in view of U.S. Patent 6,224,837 to Okamoto et al. and/or U.S. Patent 7,079,370 to Dong et al. and Applicant respectfully requests that the rejections under 35 U.S.C. 103(a) over Kusano '424 in light of Kusano '430 in view of U.S. Patent 6,224,837 to Okamoto et al. and/or U.S. Patent 7,079,370 to Dong et al. be withdrawn.

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over the '424 Kusano patent in light of Kusano '304 in view of U.S. Patent 5,411,713 to Iwanaga.

Please cancel claim 16.

Claims 1, 2, 12, and 13 have been rejected on the ground of nonstatutory obvious-type double patenting as being unpatentable over claims 1, 4, and 5 of U.S. Patent 6,734,964 B1 (hereafter referred to as the '964 patent). According to the Office Action, "...Although the conflicting claims are not identical, they are not patentably distinct from each other because the recited gas supplies and plasma generating region are equivalent to the patent's means for flowing a gas and hollow tube, respectively...".

Applicant has amended claim 1. Applicant submits that claim 1 as amended is not obvious in view of the '964 patent because the plasma support gas tube, active reaction gas tube, and housing of the presently claimed apparatus are configured such that reaction gas that passes through the discharge chamber is surrounded by a layer of plasma support gas, while the apparatus of the '964 patent does not teach or suggest such a configuration.

Applicant has cancelled claim 16 and added new claims 17 and 18. Claim 16 was meant to provide claim coverage to a plurality of mini-plasma generating devices that can operate together. Applicant submits that new claims 17 and 18 provide this coverage.

Applicant respectfully requests that this amendment be entered into the present patent application.

For the reasons set forth above, Applicant believes that all currently pending claims are in condition for allowance, and such action at an early date is earnestly

SN 10/616,610

Docket No. S-100,580In Response to Office Action dated October 12, 2006

solicited. No new matter has been added by the above changes. Reexamination and reconsideration are respectfully requested.

Respectfully submitted,

Date: February 9, 2007

Samuel L. Borkowsky
Signature of Agent

Reg. No. 42,346
Phone (505) 665-3111

Samuel L. Borkowsky
Los Alamos National Laboratory
LC/IP, MS A187
Los Alamos, New Mexico 87545